

**I CLAIM:**

1. A backplane system, comprising:  
a substrate;  
a waveguide connected to the substrate;  
5 at least one transmitter connected to the waveguide for sending an electrical signal along the waveguide; and  
at least one receiver connected to the waveguide for accepting the electrical signal.
- 10 2. The backplane system of claim 1, wherein the substrate is a multilayer board.
3. The backplane system of claim 1, wherein the transmitter and the receiver are transceivers.
4. The backplane system of claim 3, wherein the transceivers are broadband microwave modems.
- 15 5. The backplane system of claim 1, wherein the waveguide is one of a non-radiative dielectric and an air-filled rectangular waveguide.
6. The backplane system of claim 1, wherein the waveguide has a gap therein for preventing propagation of a lower order mode into a higher order mode.
- 20 7. A backplane system comprising:  
a first dielectric substrate;  
a second dielectric substrate disposed generally parallel to and spaced from the first substrate; and  
first and second conductive channels disposed between the first and second

substrates, wherein the first channel is disposed along a waveguide axis, and the second channel is disposed generally parallel to and spaced from the first channel to thereby define a gap between the first and second channels along the waveguide axis,

wherein the first and second conductive channels are affixed to at least one  
5 of the first and second substrates, and

wherein the gap has a gap width that allows propagation along the waveguide axis of electromagnetic waves in TE  $n,0$  mode, wherein  $n$  is an odd number, but suppresses electromagnetic waves in a TE  $m,0$  mode, wherein  $m$  is an even number.

8. The backplane system of claim 7, wherein  $n$  is one and  $m$  is two.

10 9. The backplane system of claim 7, wherein  
each said channel has a respective upper broadwall, a respective lower broadwall opposite and generally parallel to the corresponding upper broadwall, and a respective sidewall generally perpendicular to and connected to the corresponding upper and lower broadwalls;

15 the upper broadwall of the first channel and the upper broadwall of the second channel are generally coplanar; and

the gap is defined between the upper broadwall of the first channel and the upper broadwall of the second channel.

10. The backplane system of claim 9 wherein the lower broadwall of the first  
20 channel and the lower broadwall of the second channel are generally coplanar; and a second gap is defined between the lower broadwall of the first channel and the lower broadwall of the second channel.

11. The backplane system of claim 7, wherein the first channel has a generally C-shaped cross-section along the waveguide axis.

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12. The backplane system of claim 7, wherein the first channel comprises a bent sheet of electrically conductive material.
13. The backplane system of claim 7, wherein the first and second conductive channels are laminated to at least one of the first and second substrates.
- 5 14. The backplane system of claim 7, wherein the first and second conductive channels are glued to at least one of the first and second substrates.
15. The backplane system of claim 9, wherein the upper broadwalls are affixed to the first substrate, and the lower broadwalls are affixed to the second substrate.

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